DOCUMENT RESUME

ED 314 051 IR 052 977

AUTHOR Dubey, Yogendra P.
TITLE Information Poverty: A Third World Perspective.
PUB DATE 85
NOTE 13p.
PUB TYPE Information Analyses (070) -- Viewpoints (120)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Developing Nations; *Information Systems; Problems; *Scientific and Technical Information; Scientific Literacy; Technological Literacy; *Technology Transfer
IDENTIFIERS *Information Industry

ABSTRACT

This paper discusses problems with information systems and services, particularly those relating to information on science and technology, in third world countries: (1) problems in collection development; (2) financial problems, including legal and political constraints; (3) a low degree of scientific literacy; (4) communication barriers; (5) lack of widespread awareness of the importance of information; (6) absence of a national bibliographic control system; and (7) obstacles to access and use of online databases. A framework for improving information services by developing information as a productive component of industry is presented. This framework calls for development of computer and telecommunication technology and stresses the importance of the involvement of the governments of third world countries in the planning and funding processes. Twenty references are listed. (MES)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED314051

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

INFORMATION POVERTY:

A THIRD WORLD PERSPECTIVE

Yogendra P. Dubey

Scientific and technological information is a vital resource for national development and is central to economic and social progress. Third World countries have adopted national information policies to facilitate access to such information. The information systems of these countries are not effective because of a number of constraints: dependence on advanced countries for primary sources of information; escalating costs of sources of information and prohibitive expense in accessing databases; control of information for security and national interest; inadequate delivery systems; inadequate attention to the systematic collection, control, dissemination, and preservation of foreign and national resources; inadequate attention to the systematic collect, control, dissemination, and preservation of foreign and national resources; inadequate information processing and communication technologies; information illiteracy. A flexible approach is required to improve information services based on the capabilities and needs of diverse components of Third World countries.

Dubey is an Associate Professor in Library and Information Science at the Banaras Hindu University, India.

IR052977

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Yogendra P.Dubey

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

INTRODUCTION

Current efforts of Third World countries to eliminate information poverty are parallel to their efforts to alleviate the acute and worrisome economic poverty. Since economic prosperity can be achieved only through the application of science and technology, Third World countries give major emphasis to improving the scientific and technological base of their economy. This in turn creates demand for scientific and technology information (STI) essential for cultivation of science and technology and for their application to economic progress. Governments of many Third World countries formulated and adopted an information policy as an integral part of their national development plans; then they established information systems for collecting, processing, and disseminating scientific and technological information.

Third World countries vary considerably in the level of development and performance of information systems and services. These countries are categorized broadly in the following three groups.1

Countries in which the information infrastructure is fairly well developed including computerized facilities for information flow in the most critical sectors.

Third World countries in which information facilities have been set up in key sectors of the economy, and an operational base for scientific and technological information has been established through universities, documentation centers, and so forth.

A large number of Third World countries in which information activities on science and technology are at a very low level.

In many Third World countries information systems are services have proliferated, but they have little bearing on the cultivation of science and technology in relation to economic growth and social development because of constraints to information flow. Gottschalk has aptly stated that "the setting up of the machinery necessary for the transfer of information--services, systems and networks--will not by itself guarantee universal access to information. Many obstacles, not all of them technical, still remain to hinder a free and more balanced flow of information."*2*

Many of the major problems have already been succinctly discussed by Saracevic,*3* Lancaster,*4* Neelamegham,*5* Eric Baark,*6* and others including numerous reports emanating from national international agencies. This endeavor attempts straightforward approaches to the problems pervading Third World countries. Problems are addressed here that appear to be widening the gap between information rich advanced countries and information poor Third World countries.

Problems in Collection Development

In many Third World countries, libraries and documentation centers are the basic institutions of information. Their main function is to make the primary sources of scientific and technological information (books, periodicals, etc.) available. It is reported that these institutions rely very heavily on advanced countries for primary sources of scientific and technological information.*7* One obvious reason is that Third World countries' publication systems are extremely poor with very low output.

The document supply system is also extremely inefficient. Most of the

Third World countries have few book suppliers who can cater to the demands for foreign books and serials; and often they are not efficient. Direct supplies from the producer countries are minimal due to foreign exchange restrictions and complex accounting procedures prevalent in Third World countries.

Libraries and documentation centers have little choice for selection since they have to select titles from the stock made available to them by the local suppliers. Therefore, book collection is haphazard, inconsistent, and inadequate to meet even the basic needs of information-seeking individuals.

In the case of serials publication, the situation is still more critical. Excerpts from a Nigerian experience quoted from Saracevic's article is quite illustrative of this problem faced by many Third World countries: "..Delays in transportation (cause), delays in receipt of the journals from publishers (mostly foreign)..Orders take four to six months (to be served)..because of surface mail. Air freight would raise the total cost of the subscription far out of proportion to the library's budget for journals..Journals are lost in transit due to poor postal service..Delays cause inability to claim missing issues of journals..because publishers demand that claims be made within sixty to ninety days..over paying for the missing copies occurs when reordering (i.e., they pay twice)... Because of such losses, gaps frequently occur in the collection.8

Financial Problems

For Third World countries, financing collection development is the most critical problem. There are many reasons. First, scientific and technological literature is expanding at a very rapid rate increasing the financial burden of maintaining current coverage of even the most essential information sources. Secondly, the cost of publication itself is escalating rapidly.9

Third World countries suffer immensely due to inflationary trends in the costs of publications, because payment must be in the currencies of the producer countries.

Inflation in industrialized nations erodes the value of foreign exchange reserves are very valuable in financing imports necessary for industrialization and for fighting domestic inflation. Owing to limited foreign exchange reserves, libraries and documentation centers have the lowest priority in foreign exchange allocation for imports of informa-tional materials. Furthermore, external inflation causes the purchasing power of Third World countries to diminish. While budgets are increasing in absolute terms, purchasing power is actually declining, forcing libraries and documentation centers to cancel subscriptions and purchase fewer titles. The cumulative effect of inflation is considerable scarcity of current publications in Third World countries.

The increasing use of photocopying and other electronic reproduction facilities in industrialized countries has cause the sale of commercial publications in advanced countries to decline resulting in a corresponding decline in economic returns. To counteract the loss of revenue, prices of books and journals have increased, reducing the purchasing capability of Third World countries. Therefore, libraries and documentation centers in these countries are forced to purchase fewer foreign titles, widening the gaps in collection and therefore in knowledge itself.

Legal and Political Constraints

This use of photocopying and electronic reproduction facilities has resulted in stricter copyright laws in

advanced countries. However, copyrighting has had an adverse effect on the free flow of information to the Third World countries. Much of the scientific and technological information valuable to Third World countries (including that which occasionally originates in them, But is published in advanced countries by private and public agencies) is protected by copyright provisions, which prevent it from being transferred freely to the Third World countries.10

A growing tendency in advanced countries is to protect scientific and technological information considered to be strategically important for national security or of special economic interest. Consequently, Third World countries are deprived of access to information resources on subjects not only directly related to military interests of advanced countries, but also related to research on peripheral subjects, such as advanced computer systems, because of their economic interests. This tendency caused political tension between super-powers and Third World countries, leading the latter to demand a New International Information Order (N110) at the United Nations Conference of Science and Technology for Development (UNCSTD) held in Vienna in 1979; a demand parallel to the Third World countries' struggle to establish the New International Economic Order (NIEO).

Science-based technology is the main instrument for bringing about economic growth. Third World countries therefore are most in need of improving the technological base of their economies. However, these countries depend on industrialized countries, because national allocation to research and development in their own countries is extremely inadequate. These countries spend only 0.5 percent of the GNP on research and development as compared to nearly four percent of the GNP in some industrialized countries. The general pattern is that the larger and more highly industrialized the country and the higher GNP, the grater the promotional effort devoted to research and development. Highly industrialized countries with a higher GNP account for more than ninety-five percent of the total world expenditure on research and development. They are therefore, the major exporters of technology to the Third World countries.11

Technology transfer includes information on its use and on its efficient adaptation to a local environment. The hard fact is that information on technology is protected under the patent system, which frequently results in the need to enter into a licensing agreement with the owner of the patent, who considers protection of information essential for his own economic interests.12

Scientific and Technological Culture

Related to the question of technology transfer is the understanding of technological information. It is generally found that the advanced countries follow the "Theory into Practice" or "Research and Development" model for the development of technology.13 The model emphasizes the translation of basic research into applied knowledge. For a successful transfer of technology, a degree of scientific literacy among decision makers and users is essential. Since scientific literacy in most Third WOrld countries is limited, it impedes the proper assimilation of information to make technology work well and avoid machine and operational problems.

There is another undesirable consequence of science-based technology from the viewpoint of Third World countries. Baark has pointed out that "high technology increasingly appears to depend on scientific inputs, and consequently a number of information generating research activities (including

research of solid state physics, lasers, and genetics) tend to fall within the scope of military or commercial interests. As a result, essential information inputs are increasingly becoming inaccessible by public systems with serious implication for developing countries.14

The distinctive feature of the scientific and technological research based on the research and development model is that it is highly dependent upon the support of sophisticated instrumentation and equipment, which are often inordinately expensive and complex to use. In order to harness the potential value of STI imported from advanced countries, these research instruments and equipment are essential. Since many Third World countries cannot afford such expensive instruments and equipment, their research laboratories often remain poorly equipped. This ultimately acts as a barrier to the use of STI, and seriously inhibits communication between scientists and technologists from advanced countries and Third World countries.15

Communication Barrier

The changing characteristics of scientific papers are adversely affecting the ability to access knowledge and the capability to react, which are important aspects of the communication cycle. Bottle has noted that "the older papers, especially those published in the first decade of the present century, strike one immediately as being much easier to read than today's papers, even when one is familiar with the subject matter.16 The increasing use of unfamiliar words, which are generally polysyllabic, and abstract concepts are making the papers more difficult to read and understand. A readability study made by Sardar has shown that the use of unfamiliar words caused the relative decline in the understanding of the papers.17 Similarly Allen has noted the relative decline in the understanding of papers in the field of engineering due to increasing reliance on abstract concepts.18 These factors inhibit understanding the papers in Third World countries even more because of poor comprehension of scientific and technical jargon and low scientific literacy.

Language is indeed a major stumbling block in the communication of scientific and technological information in Third World countries as has been made evident by Guha in his UNESCO-sponsored survey.19 Because sixty or seventy percent of primary scientific papers are now in English, a majority of scientists from the Third World must read material that is not in their mother tongue.20 The language barrier frequently thwarts the ability to utilize the results of scientific and technological research because English is increasing in complexity, while competency in English as a second language among users of STI in Third World countries seldom exists. The problem of accessing information published in other foreign languages is even more acute as adequate and effective translation and interpretation facilities barely exists in Third World countries.

Lack of Widespread Awareness of Importance of Information

Information systems and services have not been fully integrated in the national development process of many Third WOrld countries. This is attributed to the lack of full awareness of the importance and role of information in national development. Commenting on this issue, Saracevic has aptly pointed out that "it is slowly, very slowly being recognized that the dynamic process of development involves, in addition to the human, economic, technical, and physical factors, information as well. Many reports state that if there is any one factor to be isolated as a greatest internal and external obstacle to beneficial use of STI

in development, it is the low level or even lack of recognition of its potential role and value particularly among decision makers and officials of higher rank in (Less Developed Countries) LDC. Even where there is recognition it is often only lip service when measured by the proportion of resources allocated to STI activities.21 The expenditure on STI as part of research and development is about one percent or less in Third World countries, as compared to advanced countries (Such as the United States) where two to three percent of the research and development expenditure is for STI.22

The low demand for service placed on the primary institutions of information (i.e. libraries and documentation centers implies that these institutions are ineffective instruments in the dissemination of information and have failed to create an awareness about the value of information among the potential users. The tendency generally found among librarians reflects an ostrich-like preference to remain absorbed in traditional and routine tasks so as not to be aware of what is going on around them. Reviewing the condition of these institutions, Saracevic wrote that "academic, research, and special libraries owned by universities, research institutions, government departments and industrial organizations were first to emerge--parallel to the establishment and evolution of their parent organizations. They remain basic and most important, albeit also a very neglected source of information. In general, they are more product than service oriented, i.e., more toward production of bibliographies, catalogues, etc., than toward services directly oriented to users (such as question-answering).23

Often the passive role of librarians and information specialists is responsible for the low use of informational resources. They are seen as house-keepers, organizers, or managers, but not as people who aid the potential users in the interpretation and use of informational resources. The traditional view of the library is as a passive entity; and the librarian as a nonassertive partner in the search by information seekers that counteracts their motivation to use the informational resources. In consequence, a sizeable number of potential users remain unaware of the primary and secondary sources of information.

Because of inadequate knowledge of primary and secondary sources of information, there exists a dangerous gulf of ignorance among scientists and researchers that becomes evident by rejection of manuscripts submitted for publication in journals published in advanced countries. Neelamegham has reported that "scholars from the developing countries experience a high rate of rejection when submitting manuscripts to journals because they frequently reveal a lack of awareness of earlier research.24

The onus for the lack of awareness of the value of information and resources also falls on the educational system. In many Third World countries, the education system is the legacy of the colonial era, and is largely textbook oriented. The system seldom aims at enhancing the creativity and curiosity of individuals by developing their critical faculty to analyze and evaluate written material and question accepted doctrines. "It fails to impress people with the value of information resources; to expose them to the range of these resources, and above all to teach hem how to derive benefits from them.25

The success of information systems depends upon clearly laying out objectives and goals and judiciously developing resources to achieve them. The evidence unequivocally shows that the benefits of information systems are not reaching the majority of the user population nor do the

systems have sufficient depth to reduce information poverty, let alone eliminate it. One important reason is the lack of clear conceptual understanding. Saracevic has put it more elegantly by commenting that "it is fair to observe that national information systems are a political conceptualization rather than operational realities.26 Consequently, information systems are not perceived as an active partner in economic progress, and have failed to reach diverse and dispersed groups of users, and to rate appropriate systems for transfer of information tailored according to the differences in their needs and behaviors.

The hard fact is that far too frequently information systems tend to receive the lowest priority and are considered to be an inordinately expensive luxury. Unfortunately, this is reflected in the actions of political decision makers when libraries and information systems are the first casualties of funding cuts.

Absence of a National Bibliographic Control System

In the absence of an efficient national bibliographical control system in many third World countries, the only means to access scientific and technological information produced within these countries is through secondary sources of information published in advanced countries. However, due to parochialism concerning what is worthwhile to publish, information produced in Third World countries is only partially covered by these services. As a result, a scientific researcher from a Third World country is unable to find all of the relevant information produced within his own country, thereby increasing the risk of duplicating what already exists and of not benefiting from knowledge already acquired. Valls describes this problem neatly, based on facts from the asian scene, by commenting that "some surveys have established that about 70 percent of the scientific and technical literature generated in Asian developing countries are not recorded in any of the lager secondary information sources produced in the West. This means that most of the scientific and technological production of developing countries will remain unknown. Though not always of high level, such documents are nevertheless highly relevant to the developing countries problems and should be known at least by those countries.27

Obstacles to Access and Uses of Online Databases

The pressing need for the growing volume of scientific and technological information for national development has re-enforced the need for researchers and decision makers in Third World countries to access readily online databases developed and located in advanced countries.

The prospect for accessing and effectively using online databases is bleak in many Third World countries due to a number of obstacles. The foremost obstacle is the high cost involved in accessing online databases. A series of studies conducted by the Interim Fund for Science and Technology for Development (IFSTD) and UNESCO (jointly launched by the General Information Programme of UNESCO in 1981 to diagnose the needs and study of available systems for information handling in developing countries) concluded that "in the eight countries studied both information specialists and development planners would like to forge online links to the many databases held in most computers in North America, Europe, and elsewhere. But they are greatly discouraged by the high units costs of long distance searches, and only two countries have established links to online networks.28 According to Baark, "the total cost of such databases

includes both access fees of various kinds (e.g., subscription rate, hourly rate, online or offline print) and the telecommunication costs, which in the case of most developing countries that require inter-continental linkages are prohibitive. The cost of a typical search, say, a half hour interactive search from Brazil, may amount to almost a third of the average income of a researcher in Brazil, and much more than the average monthly income of a worker.29

The technical obstacles to accessing online databases are mostly related to the backward levels of telecommunication systems in many of the third World countries. Writing of this problem Baak observes that "although quite a few of them have established one or several linkages with international satellite communication systems, local communication systems are frequently fraught with technical problems. The result is that at best, there will be only one communication node in the country, and the establishment through this node of a decentralized network for accessing to international communications is very difficult.30

Quite a large number of online databases are run by the private sector, which considers information to be an economic resource and a commodity to generate profit. As a result, it is more concerned about safeguarding trade, business and financial interests by copyright, data rights and trade restrictions, and reciprocal or bilateral agreements. These restrictions, and reciprocal or bilateral agreements. These restrictive practices inhibit Third World countries from taking full advantage of online databases.

Another problem is the value to the Third World of data stored in online databases. The databases contain information produced in advanced countries primarily in response to the demand of users from those countries. Gottschalk has noted that the relevance of much data is "independent of the level of a Third World country's needs and development. Therefore, the access to these databases is of mixed value to the Third World countries and in many cases may not be justified by the cost involved.31

According to Ruhl, the ability to use online databases in each Third World country is determined by two factors: the established scientific and technology infrastructure in the country, and a larger exposure to the availability of the databases.32 Representatives from Chemical Abstracts Services, Biosciences Information Service, and NTIS indicate that generally, developing country users find relatively little material of interest to them in those organization's databases. Exceptions are those institutions in Latin America and the Middle East, for example, where there are scientific activities and databases that have been available for some time.

Gottschalk has made it plain that language can be a serious barrier to the use of online databases.33 Most of the databases publicly available are in English, and others including those being developed in Western Europe, are in the language of the country of their origin. It is most likely that multilingual thesauri and computerized aids currently under development will soon be available to alleviate the language barrier.

Conclusions and Recommendations

In conclusion, it can be seen that constraints to the free flow of information in the contemporary Third WOrld are of various dimensions--formal and informal, national and transnational--and that they are intricately interwoven. These constraints stem from a variety of factors including financial, legal political, communicative, scientific, technical, and even psychological.

A number of suggestions have been made by individuals, as well as national and international bodies, concerning the treatment of these problems. Obviously, it is beyond the scope of this article to describe them. A framework is presented herein that may permit activities under a single organizational umbrella. A useful way to draw such a framework is from Lewis's concept of development: "effort to economize" "accumulation of capital," and "accumulation of knowledge." The last one is a brilliant analysis of the role of knowledge in development. A premise can be drawn from this that information, which after processing (i.e.. reasoning by human beings) becomes knowledge, is a vital resource to generate wealth by improving utilization of natural resources. It calls for information to be a productive component of industry, which is to be invested as well as managed and on par with any other industrial sector of the economy. Furthermore, it calls for an integrated plan of action to develop and strengthen various components of the information industry in a coordinated fashion. These components have been identified and grouped broadly as the following.35

- information distribution industries (publishing, libraries, scientific and technical services, professional manpower, etc.) for which information is a capital resource as well as a means for creating products;
- knowledge production industries (research and development, education, etc.) for which information is the fundamental product;
- and information technology industries (computer and telecommunication technologies, mass communication technology including radio, TV, etc.) which facilitate acquisition, storage, processing and distribution of information.

The concept of an information industry puts new emphasis on developing and strengthening the indigenous publishing industry as a national priority to meet internally changing needs and requirements. Similarly, libraries and information activities including generation, processing, and dissemination, need to be improved with new service orientation. This calls for a radical surge in their planning and management process. In this content it is relevant to recall some remarks made by Hayes who suggested that "decisions need to be made about the proper levels of investment in information resources, about where those investments should be made, about how those investments should be managed, about how the information should be processed and distributed and how it should be used most effectively.36 A key to acceptance of the changing role of these primary institutions of information will be their ability to provide systems that can facilitate communication of information to different categories of the user population.

Third World countries need to invest vigorously and consistently in research and development in order to remain responsive to social needs and wants. Each country should see that its industrial/commercial enterprises and educational/research institutions work in harmony; drawing together the right mix of separate resources into a dynamic interaction in order to generate useful information to purposefully cultivate science and research in the national interest.

The responsibility for the efficient conduct of the information industry falls upon the professional cadre of information specialist/managers who must be developed with satisfactory calibre and strength through a vigorous training

programing oriented to new goals and aspirations.

Since information industry depends upon information technologies, Third World countries should adopt a comprehensive plan to develop an infrastructure that manufactures, supplies, services, and uses computers (including software) and telecommunications. Special attention should be given to acquire and develop the economically viable and fast developing microcomputer technologies. The development of computer and communication technologies will enable the Third World countries to access and explore the vast pools of information stored in machine-readable form in existing databases of advanced countries.

The governments of Third World countries have the chief responsibility for fostering the information industry. The development of an information industry is a challenging and formidable task that requires the government's active involvement in the planning process and funding support. It emphasizes incremental development plans to be pursued within the framework of a well thought-out national information policy. The development plans and programs should be pursued in a consistent and systematic manner rather than dealing with them in an ad-hoc way.

It is difficult to perceive for the present any tangible solution to the barriers to the free flow of information between advanced countries and the Third World that arise out of protectionist measures dictated by defense and commercial interests. It has been aptly noted by Naark that they will be extremely difficult to remove, given the political situation in the world today.37 However, if concerned parties in the advanced countries take positive steps in allowing an unrestricted flow of information to the Third World countries, it will ultimately be beneficial to the. By allowing an unrestricted flow of information and cooperating with the Third World countries in research and development, they may in time find a new frontier for their research effort. They may also find a potential market in Third World countries for information industries that exist in their own countries. The mutual cooperation between North and South will help to show that efforts being made by international agencies (UNDP, UNCSTD, UNESCO) to promote a scientific and technological information infrastructure in Third World countries is essential to their economic progress. If the bell of progress and prosperity tools for the South it also tolls for the North.

REFERENCES

1. Report of the Ad-hoc Panel of Specialists on Information Systems for Science and Technology for Development, held in Rome, Italy, 21-25 January 1985 (New York: United Nations, 1985),10.

2. Charles Gottschalk, "Database Management Concerns at the International Level," in Database Management in Science and Technology: A CODAT A Sourcebook on the Use of Computers in Data Activities, eds, John R. Rumble, Jr. and Viktor E. Hampel (North Holland, NY: Elsevier Science Publishes, 1984),252.

3. Tefko Saracevic, "Perception of the Need for Scientific and Technical Information in Less Developed Countries," Journal of Documentation 36 (September 1980): 214-267

4. F.W. Lancaster, "Information Poverty and Information Overload," in The Infrastructure of an Information Society, eds. B. El-Hadidy and E.E. Horne (North Holland, NY: Elsevier Science Publishers 1984), 411-419.

5. A. Neelameghan, "Some Issues in Information Transfer: A Third World Perspective," IFLA Journal 7 (1981): 8-18.

6. Eric Baark, "Constraints on the Flow of Scientific and Technological Information: A Review of Issues with Particular Reference to Developing Countries," in Scientific and Technological Information for Development. Proceedings of the Ad-hoc Panel of Experts on Information Systems for Science and Technology for Development, held in Rome, Italy, 21-25 January 1985 (New York: United Nations, 1985), 107-112.

7. Yogendra P. Dubey and J.B. Subramaniam, "Serials Management: (Paper presented at the Seminar on New Trends in Management of Libraries, 19-22 December 1984. Department of Library and Information Science, University of Poona, India, Mimeographed.)

8. Saracevic, 235

9. Baark, 108.

10. IBID.

11. John P. Dickinson, Science and Scientific Researchers in Modern Society. (Paris: UNESCO, 1984), 2,223.

12. Baark, 108.

13. R.G. Havelock et al., Planning for Innovation Through Dissemination and Utilization of Knowledge. (Institute for Social Research, University of Michigan, 1975, 4th printing 1973), 10.41-10.42.

14. Baark, 109.

15. Baark, 110.

16. R.T. Bottle, "The Declining Readability of Scientific Papers as a Factor Limiting the Transfer and Use of Knowledge," in Representation and Exchange of Knowledge as a Basis of Information Process, ed. H.J. Dietschmann (North Holland, NY: Elsevier Science Publishers, 1984), 175-176.

17. Z. Sardar, "Noise in Written Communication" (M.SC. thesis. The City University, London, 1975)

18. T.J. Allen et al., "The International Technological Gatekeeper," Technology Review 73 (1971): 36-43

19. B. Guha, "On the Language Barrier in the Production DIssemination and Use of Scientific and Technical Information with Special Reference to the Problems of the Developing Countries," (Paris: UNESCO, 1985): 1-8/ws/34.

20. Bottle, 182.

21. Saracevic, 216.

22. D.W. King, et al., Statistical Indicators of Scientific and Technical Communications (1960-1980). (Washington: King Research Inc.), B-254 060.

23. Saracevic, 222-223.

24. Neelameghan, 14.

25. Lancaster, 414.

26. Saracevic, 223.

27. Jacques Valls, "Information Challenge and Improvement of Information Services," Academic Resources Journal 3, no.1 (April 1981):17.

28. United Nations Education, Scientific and Cultural Organization, Executive Summary Report. Science and Technology Information, Analytical Case Studies (Intergovernmental Council for the General Information Programme 3rd session, 26-30 October 1981). PGI/84/COUNCIL/111/INF.5, 10p. UNESCO Paris, June 1981.

29. Baark, 108.

30. Ibid.

31. Gottschalk, 253

32. Mary Jane Ruhl, "Public and Private Data Bases and Services in the United States: Their Availability and Usability in Developing Countries," in Scientific and Technological Information for Development. Proceedings of the Ad-hoc Panel of Experts on Information SYstems for Science and Technology for Development, held in ROme, Italy, 21-25 January 1985 (Paris: UNESCO< 1985), 117.

33. Gottschalk, 254.

34. W.A. Lewis, Theory of Economic Growth. (London: G. Allen and Unwin, 1954.)

35. Robert M. Hayes, "Issues in Developing the Infrastructure of National Information Systems," in The Infrastructure of an Information Society, eds. B. El-Hadidy and E.E. Horne (North Holland, NY: Elsevier Science Publishers, 1984), 142.

36. Robert M. Hayes, "Manpower Issues: Implications for Training and Retraining of Librarians," Bulletin of the Medical Library Association 71, no.4 (October 1983): 428.

37. Baark, 111.